JHR 47: 115–122 (2015)
doi: 10.3897/JHR.47.6805
http://jhr.pensoft.net

SHORT COMMUNICATION

JOURNAL OF Hymenoptera RESEARCH
A peer-reviewed open-access journal
The International Society of Hymenopterists

Nests of bees of the anthidiine genus *Ananthidium* Urban (Hymenoptera, Apidae, Megachilinae)

Daniele R. Parizotto[1], Gabriel A. R. Melo[1]

1 *Laboratório de Biologia Comparada de Hymenoptera, Departamento de Zoologia, Universidade Federal do Paraná, Caixa Postal 19020, 81531-980, Curitiba, Paraná, Brazil*

Corresponding author: *Daniele R. Parizotto* (dparizotto@gmail.com)

Academic editor: *J. Neff* | Received 8 October 2015 | Accepted 12 November 2015 | Published 22 December 2015

http://zoobank.org/75402A53-667E-45FD-BEFE-5954C70CA3CF

Citation: Parizotto DR, Melo GAR (2015) Nests of bees of the anthidiine genus *Ananthidium* Urban (Hymenoptera, Apidae, Megachilinae). Journal of Hymenoptera Research 47: 115–122. doi: 10.3897/JHR.47.6805

Abstract

We present data on nests of the two species of the neotropical bee genus *Ananthidium* Urban (Megachilinae, Anthidiini). Five nests of *Ananthidium dilmae* Urban, a species from southern and southeastern Brazil, were found in grassland areas at the Vila Velha State Park, Ponta Grossa, in Paraná State. The aerial nests were made of resin mixed with plant fibers and each contained one or two cells. One female and one male emerged from two of the nests. Notes on the nest of *Ananthidium inerme* (Friese), a species known from Argentina and Paraguay, are provided based on two nests deposited in Berlin's Museum für Naturkunde, Germany. This species also builds aerial resin nests attached to plant stems, with external shape and dimensions similar to those of *Ananthidium dilmae*.

Keywords

Anthidiini, biology, neotropical, resin, solitary bee

Introduction

Most species of Anthidiini are solitary, with females building their nests exposed, in hollows of trees, in cavities abandoned by other insects, or in the soil, such as those constructed by *Trachusa* Panzer and *Paranthidium* Cockerell & Cockerell (Grigarick and Stange 1968, Morato 2001, Gess and Gess 2007, Rozen and Hall 2012). The nests are constructed with a great variety of materials, such as resin, pieces of leaves and

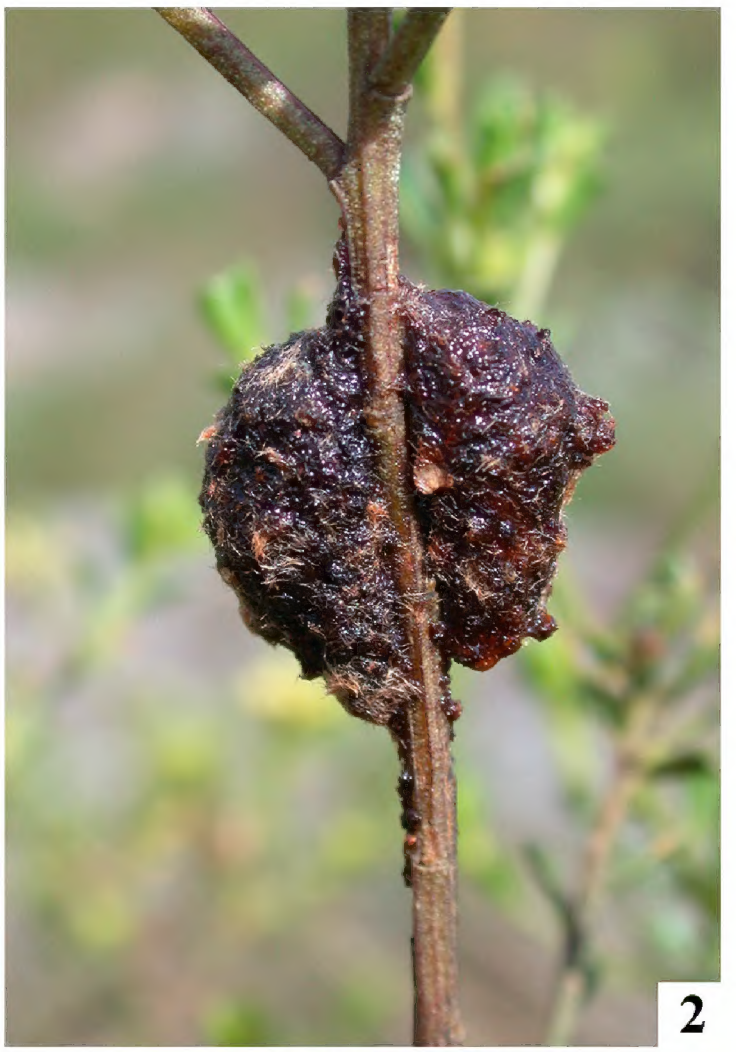
flowers, plant fibers and pebbles or even animal hair. The tribe also possesses obligatory cleptoparasitic genera that parasitize other species of Megachilinae, with a few taxa attacking unrelated bee groups, such as *Hoplostelis* Dominique that parasitizes nests of orchid bees (Apinae, Euglossini). Reports on the nest biology of the tribe are relatively scarce, especially for neotropical taxa (Jörgensen 1912, Claude-Joseph 1926, Janvier 1955, Laroca and Rosado-Neto 1975, Morato and Campos 2000, Morato 2001, Alves-dos-Santos 2004, Alves-dos-Santos et al. 2004, Camarotti-de-Lima and Martins 2005, Zanella and Ferreira 2005, Rozen 2015, Alvarez et al. 2015). Among Brazilian species, limited information indicates that *Dicranthidium arenarium* (Ducke, 1907) (Laroca and Rosado-Neto 1975) and *Anthodioctes manauara* Urban, 1999 (Morato 2001) construct their nests in abandoned mud nest of eumenine wasps.

Ananthidium Urban is a neotropical genus with two species, *Ananthidium inerme* (Friese, 1908) and *Ananthidium dilmae* Urban, 1992. The first species is known from Argentina and Paraguay while the second is known only from southern and southeastern Brazil. This small group was given genus status by Urban (1992) and Stange (1995) whereas Michener (2007) treated it as a subgenus of *Epanthidium* Moure, along with two other subgenera (*Epanthidium* and *Carloticola* Moure & Urban). A phylogenetic analysis of the tribe (Parizotto 2011) indicated that *Ananthidium* is not closely related to *Epanthidium* and is herein treated as a separate genus, according to the classification proposed by Urban and Moure (2007). Here we provide information on the nest architecture of *Ananthidium* as a contribution to the knowledge of the biology of the tribe in the Neotropical region.

Results

Ananthidium dilmae

A total of five nests were collected in the Vila Velha State Park, a reserve in the municipality of Ponta Grossa, Paraná, Brazil. Vila Velha contains sandstone formations of significant scientific, cultural and ecological value, located in southern Brazil (25°15'S; 50°00'W) within a broader region known as Campos Gerais (Gonçalves and Melo 2005, Schimandeiro et al. 2008). The park has a total area of 3,122 hectares primarily covered by grasslands with predominance of Poaceae, Cyperaceae, Asteraceae, Verbenaceae and Fabaceae. Nests were found on three different dates: the first one was collected on 23.xi.2002, the second on 12.xii.2002, and the last three on 30.iv.2011. The first and the last three nests were found in the highest plateau within the park, a site known as "Fortaleza", while the second nest was found in a nearby grassland site within the park. All material studied here are deposited at DZUP (Coleção Entomológica Padre Jesus Santiago Moure, Universidade Federal do Paraná). Nests were collected in shrub vegetation at about 0.5 m above the ground and, except for one nest attached to a living branch, all nests were attached to dead branches of *Baccharis* spp. (Asteraceae) (Fig. 1).



Figures 1–4. Nests of *Ananthidium dilmae*. **1** Nest on a branch of *Baccharis* sp. (Asteraceae), found in the Vila Velha State Park, in southern Brazil (nest 1) **2** Close up view of the two-celled nest in the field **3, 4** Close up views of nest 5 under the stereomicroscope using different lighting to show plant fibers mixed with resin; the tip of the metasoma of the male completely emerged in Fig. **4** can be seen in Fig. **3** exiting through the cell entrance.

Table 1. Measurements (in millimeters) of the main structures of the nests of *Ananthidium dilmae* collected at Vila Velha State Park, Ponta Grossa, Paraná, Brazil and *Ananthidium inerme* collected in Mendoza, Argentina.

Nest	Number of cells	Branch diameter	Cell length	Cell width	Cell wall thickness	Diameter of cell opening
Ananthidium dilmae						
1	2	2.4	11.6 /12.5	5.4/ 5.0	1.1	4.5/4.0
2	2	1.1	13.1/12.6	6.4/6.5	1.1	3.2/3.6
3	2	3.0	14.3/ 15.7	6.8/6.0	1.2/1.1	3.0/3.5
4	1	2.0	13.4	5.9	1.2	4.5
5	1	7.9	13.3	6.1	1.2	4.0
Ananthidum inerme						
1	1	3.0	11.0	4.8	-*	3.5
2	1	3.3	9.0	5.0 (4.5)	0.5–0.7	3.5

*Nest entirely closed.

Nests consisted of one or two oval-shaped brood cells attached to the branches along its longest axis, with the circular cell openings facing downward (Fig. 2). Cell size was similar between one and two-celled nests (Table 1). Nests were made of resin mixed with plant material, apparently plant trichomes (Fig. 3). Although externally the appearance of the resin ranged from rugose (nest 1) to smooth (other nests) among nests, it was always brown to dark brown in color (Figs 3–4). The cell closure has a vitreous aspect, perhaps due to the presence of more resin and fewer trichomes.

The first nest had two closed cells from which a female of *Ananthidium dilmae* emerged; the second and third nests were empty with their brood cells open; the single-celled fourth nest was opened and only a damaged Diptera puparium was found inside the cell; a male of *Ananthidium dilmae* emerged from the fifth nest (Figs 3–4).

Ananthidium inerme

Two nests of this species (Fig. 5) are deposited in the bee collection of the Berlin's Naturkunde Museum, Germany (ZMB). The label associated with the nests reads "Nest cells of *Anthidium inerme* Fr. made of resin in thorn bushes - Mendoza (Argentina 1912)" ["Nestzelle aus Harz an Dornbüschen von *Anthidium inerme* Fr. - Mendoza (Argentina) 1912" in the original label (see Fig. 5)].

The shape and size of these nests are comparable to those of *Ananthidium dilmae* (Table 1) although apparently no plant fibers were used. Nest 1 (Fig. 6) has a large number of fine soil particles attached to its upper surface, but because no sand or soil was found within the resin matrix this might be the result of soil being spilled over the nest by rain drops or simply contamination during its collection. No soil particles were observed on the surface of the second nest (Fig. 7).

Figures 5–7. Nests of *Ananthidium inerme*. **5** The two nests examined in this study, which are glued to a paper card, are deposited in the insect collection of the Berlin's Naturkunde Museum, Germany **6, 7** Close up views of nests 1 and 2 taken under a stereomicroscope.

Nest 1 is entirely closed (Fig. 6), apparently as it was found in the field. Nest 2 is open and it might have been partially dissected soon after it was collected because a piece of its border is turned up, something that could have been done only when the resin was still malleable (Fig. 7). Inside this nest there are remains of an adult bee that had been partially eaten by dermestid beetles. We examined these remains and confirmed that they belong to a female of *Ananthidium inerme* (these remains were glued to a paper rectangle and pinned together with the nests in the drawer). Examination of the inner walls revealed no signs of a cocoon and one can conclude that the dead female might have been the nest owner and was collected with it. No further dissection of the nests was attempted to preserve their integrity.

These two nests might represent some of the nests upon which Jörgensen (1912) briefly reported on the biology of *Ananthidium inerme* (cited as *Anthidium inerme*). They might have been sent to Friese, whose original collection has to a large extent been incorporated to the ZMB (see Rasmussen and Ascher 2008), together with adult bees. None of the pinned specimens of *Ananthidium inerme* in the ZMB collection had any indication that they emerged from collected nests, although two females and two males are from Mendoza, Argentina, and were likely received through Jörgensen.

Discussion

The females of *Ananthidium* possess short, robust mandibles, presumably adapted for the manipulation of resin and plant particles. Considering that *Ananthidium* has been recovered as sister group of the clade containing *Allanthidium* Moure, *Anthidianum* Michener, *Chrisanthidium* Urban and *Notanthidium* Isensee (Parizotto 2011, see also Parizotto 2009), it is likely that these genera also make aerial resin nests. Indeed, Rozen (2015) reported recently on an aerial nest of *Anthidianum chilense* Urban, 2003 (as *Notanthidium (Allanthidium) chilense*) that is quite similar to those of *Ananthidium* described herein in the use of plant resins and in being attached to thin plant stems. Differently from the nests of *Ananthidium* reported here, in *Anthidianum* the nest was larger, with four brood cells, and had a more irregular and thicker outer surface, in which the cell contour could not be seen from the outside.

On the other hand, the available data for *Notanthidium steloides* (Spinola, 1851), the single species in the genus, indicate that it uses pre-existing cavities [wood galleries made by beetles and bamboo hollows; see Claude-Joseph (1926)]. It is possible that *Notanthidium* could be an exception in relation to the nesting biology of the clade, since they are elongate, hoplitiform bees, whose females have greatly modified heads, with a peculiar mandibular and clypeal morphology. Nothing is known of the biology of *Allanthidium* and *Chrisanthidium*, the other two genera in this Neotropical clade of Anthidiini. Addressing more general conclusions on nest morphology and on use of substrate will have to wait until further data is obtained on this large and diverse bee tribe.

Acknowledgements

We thank anonymous reviewers for comments and suggestions on this manuscript. GARM thanks Rodrigo Gonçalves for his collaboration in the field studies conducted in the Parque Estadual de Vila Velha. Frank Koch and Michael Ohl are thanked for their kind help and support during studies conducted by the second author in the bee collection of the Museum für Naturkunde, Berlin. Financial support has been received by grants from CNPq.

References

Alvarez LJ, Lucia M, Durante SP, Passarelli LM, Gonzalez VH (2015) Description of the male, new geographical record, and biological notes on the small resin bee *Hypanthidioides* (*Ctenanthidium*) *bifasciata* (Urban, 1993) (Hymenoptera: Megachilidae). Pan-Pacific Entomologist 91(2): 184–188. doi: 10.3956/2015-91.2.184

Alves dos Santos I (2004) Biologia de nidificação de *Anthodioctes megachiloides* Holmberg 1903 (Anthidiini, Megachilidae, Apoidea). Revista Brasileira de Zoologia 21: 739–744. doi: 10.1590/S0101-81752004000400002

Alves dos Santos I, Camaroti-de-Lima MF, Martins CF, Morato EF (2004) Nesting biology of some Brazilian *Anthodioctes* species Holmberg 1903 (Anthidiini, Megachilidae). Proceedings of the 8th IBRA International Conference on Tropical Bees and VI Encontro sobre Abelhas (Brazil), September 2004, 93–98.

Camarotti-de-Lima MF, Martins CF (2005) Biologia de nidificação e aspectos ecológicos de *Anthodioctes lunatus* (Smith) (Hymenoptera: Megachilidae, Anthidiini) em Área de Tabuleiro Nordestino, PB. Neotropical Entomology 34: 375–380. doi: 10.1590/S1519-566X2005000300003

Claude-Joseph F (1926) Recherches biologiques sur les hyménoptères du Chili (Mellifères). Annales des Sciences Naturelles Zoologie et Biologie Animale 9: 113–268.

Gess SK, Gess FW (2007) Notes on nesting and flower visiting of some anthidiine bees (Hymenoptera: Megachilidae: Megachilinae: Anthidiini) in Southern Africa. Journal of Hymenoptera Research 16: 30–50.

Grigarick AA, Stange LA (1968) The pollen-collecting bees of the Anthidiini of California. Bulletin of the California Insect Survey 9: 1–113.

Gonçalves RB, Melo GAR (2005) A comunidade de abelhas (Hymenoptera, Apidae s.l.) em uma área restrita de campo natural no Parque Estadual de Vila Velha, Paraná: diversidade, fenologia e fontes florais de alimento. Revista Brasileira de Entomologia 49: 557–571. doi: 10.1590/S0085-56262005000400017

Janvier H (1955) Le nid et la nidification chez quelques abeilles des Andes tropicales. Annales des Sciences Naturelles Zoologie et Biologie Animale 17: 311–349.

Jörgensen P (1912) Revision der Apiden der Provinz Mendoza, Republica Argentina (Hym.). Zoologische Jahrbücher. Abteilung für Systematik, Geographie und Biologie der Tiere 32: 89–162.

Laroca S, Rosado-Neto GH (1975) Notas bionômicas: *Hypanthidiodes arenaria* (Hymenoptera, Apoidea). Revista Brasileira de Biologia 35: 847–853.

Michener CD (2007) The Bees of the World, 2nd Ed. Johns Hopkins University Press, Baltimore, Maryland, 953 pp.

Morato EF, Campos LAO (2000) Efeitos da fragmentação florestal sobre vespas e abelhas solitárias em uma área da Amazônia Central. Revista Brasileira de Zoologia 17: 429–444. doi: 10.1590/S0101-81752000000200014

Morato EF (2001) Biologia e ecologia de *Anthodioctes moratoi* Urban (Hymenoptera, Megachilidae, Anthidiini) em matas contínuas e fragmentos na Amazônia Central. Revista Brasileira de Zoologia 17: 429–444. doi: 10.1590/S0101-81752000000200014

Parizotto DR (2009) Taxonomic notes on Neotropical Anthidiini, with description of the male of *Chrisanthidium adornatum* Urban (Hymenoptera: Megachilinae). Zootaxa 2034: 49–55.

Parizotto DR (2011) Filogenia dos Anthidiini Neotropicais (Apidae, Megachilinae s.l.). PhD Thesis, Universidade Federal do Paraná, Brazil.

Rasmussen C, Ascher J (2008) Heinrich Friese (1860–1948): Names proposed and notes on a pioneer melittologist (Hymenoptera, Anthophila). Zootaxa 1833: 1–118.

Rozen JG Jr, Hall GH (2012) Nesting biology and immatures of the oligolectic bee *Trachusa larreae* (Apoidea: Megachilidae: Anthidiini). American Museum Novitates 3765: 1–24. doi: 10.1206/3765.2

Rozen JG Jr (2015) Nest and immatures of the South American anthidiine bee *Notanthidium* (*Allanthidium*) *chilense* (Urban) (Apoidea: Megachilidae). American Museum Novitates 3826: 1–12. doi: 10.1206/3826.1

Schimandeiro A, Kantelhardt J, Weirich Neto PH (2008) Characterization of major crop management in the buffer zone of Vila Velha State Park, state of Paraná, Brazil. Acta Scientiarum Agronomy 30: 225–230.

Stange LA (1995) Further description of *Ananthidium* Urban, with keys to Argentine Anthidiini. Insecta Mundi 9: 11–16.

Urban D (1992) *Ananthidium*, um gênero novo de Dianthidiini neotropical (Hymenoptera, Apoidea, Megachilidae). Revista Brasileira de Zoologia 7(1990): 73–78.

Urban D, Moure JS (2007) Anthidiini Ashmead, 1899. In: Moure JS, Urban D, Melo GAR (Eds) Catalogue of Bees (Hymenoptera, Apoidea) in the Neotropical Region. Sociedade Brasileira de Entomologia, Curitiba, 875–913.

Zanella FCV, Ferreira AG (2005) Registro de hospedeiro de *Austrostelis* Michener & Griswold (Hymenoptera: Megachilidae) e de sua ocorrência na Caatinga. Neotropical Entomology 34: 857–858. doi: 10.1590/S1519-566X2005000500022